

CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A hydrometallurgical process for the treatment of steel mill electric arc furnace (EAF) dust containing agglomerates of small ferrite particles and larger magnetite particles, the ferrite particles coating by adsorption the larger magnetite particles, the dust further containing calcium oxide, zinc oxide and a toxic amount of leachable lead together with minor elements selected from the group consisting of Mg, Cr, Cu, Cd, V, and chlorides, the process comprising the steps of:

a) washing the EAF dust in water to dissolve soluble salts, metals and simple oxides contained in the dust, said washing step being performed under agitation and with an alkaline pH;

b) decanting the solution of step a) to obtain a supernatant liquid containing the dissolved salts, metals and simple oxides, and a slurry containing ferrites and magnetites, a non toxic amount of leachable lead and a reduced amount of calcium;

c) separating the slurry and the supernatant liquid;

d) adding to the slurry obtained in step c) an anionic surfactant a phosphate to disperse the ferrite particles adsorbed on the magnetite particles and sequester calcium compounds; and

e) treating the slurry from step d) to produce pigments selected from the group consisting of ferrite pigments, magnetite pigments and ferrite/magnetite pigments.

2. (Currently Amended) The process according to claim 1, wherein the sequence of steps a) to c) is performed more than one time before adding the anionic surfactant phosphate.

3. (Currently Amended) The process according to claim 1, wherein the solution slurry obtained in step ab) has a positive zeta potential, and the anionic surfactant phosphate is

added in a concentration sufficient to reduce said zeta potential to or close to the isoelectric point.

4. (Original) The process according to claim 3, wherein said zeta potential is reduced to the isoelectric point.

5. (Cancelled)

6. (Currently Amended) The process according to claim 1, wherein the ~~anionic surfactant~~ preferred phosphate is comprises sodium metaphosphate.

7. (Original) The process according to claim 1, wherein step c) of treating the slurry comprises the step of:

- magnetically separating the slurry into a first fraction composed essentially of brownish ferrites and a second fraction composed essentially of black magnetite, the first fraction being less magnetic than the second fraction.

8. (Original) The process according to claim 7, wherein the step of magnetic separation is performed with a magnetic field in the range of 400 to 700 gauss.

9. (Original) The process according to claim 8, wherein the magnetic field is around 550 gauss.

10. (Original) The process according to claim 7, further comprising the step of: processing the first fraction to produce ferrite pigments.

11. (Original) The process according to claim 10, wherein the step of processing the first fraction comprises:

- removing from the first fraction, particles having a grain size of 20 μm or more, to obtain a refined first fraction;
- leaching said refined first fraction with a solvent, to obtain a leached slurry;
- separating said leached slurry into a solid fraction containing ferrite pigments and a liquid fraction containing constituents of the first fraction soluble in said solvent; and

- drying said solid fraction to obtain dry pigments of ferrites.

12. (Original) The process according to claim 11, wherein the solvent is water and the ferrite pigments are ferrite pigments of a first grade.

13. (Original) The process according to claim 11, wherein the solvent is sulphuric acid, the leaching is performed at a pH of 0.5 to 3 and the ferrite pigments are ferrite pigments of a second grade.

14. (Original) The process according to claim 11, wherein the solvent is nitric acid, the leaching is performed at a pH of up to 3, and the ferrite pigments are ferrite pigments of a third grade.

15. (Original) The process according to claim 14, comprising the step of wet grinding the solid fraction to obtain a forth grade of pigments having a finer mean grain size and a lower concentration of lead as compared to the ferrite pigments of the third grade.

16. (Original) The process according to claim 7, comprising the step of:

- processing the second fraction to produce magnetite pigments.

17. (Original) The process according to claim 16, wherein the step of processing the second fraction comprises the step of: screening at 6 μm to obtain a first finer fraction with particles having a grain size of 6 μm or less; and a coarser fraction with particles having a grain size greater than 6 μm .

18. (Original) The process according to claim 17, comprising the steps of

- milling said coarser fraction, and

- removing from the milled coarser fraction the particles having a grain size greater than 40 μm and returning said particles for further milling, and a second finer fraction having particles with a grain size of less than 6 μm , resulting in said coarser fraction containing particles having a grain size between 40 and 6 μm .

19. (Original) The process according to claim 17, wherein it comprises the steps of:

- wet grinding by attrition the coarser fraction to attain a mean grain size of approximately 0.3 μm ; and

- filtering and drying the grinded coarser fraction, to obtain a magnetite pigment of a first grade.

20. (Original) The process according to claim 17, wherein it comprises the step of:

- purifying the first and second finer fractions by suspending residual contaminants contained therein with an anionic surfactant, to obtain a purified magnetic fraction;

- decanting the purified fraction;

- wet grinding by attrition the purified fraction; and

- filtering and drying the ground purified fraction, to obtain a magnetite pigment of a second grade.

21. (Original) The process according to claim 1, comprising the steps of:

- removing from the slurry obtained in step d), particles having a grain size of 60 μm or less, to obtain a refined slurry;

- leaching the refined slurry with nitric acid at a pH of about 3, to obtain a leached slurry with no or a controlled amount of ZnO which retard the setting of concrete;

- separating said leached slurry into a solid fraction containing a mixture of ferrite and magnetite pigments and a liquid fraction containing constituents soluble in nitric acid; and

- drying said solid fraction to obtain dry pigments containing a mixture of ferrite and magnetite.

22-30. (Cancelled)

31. (Previously Presented) The process according to claim 6, wherein step c) of treating the slurry comprises the step of: magnetically separating the slurry into a first fraction composed essentially of brownish ferrites and a second fraction composed essentially of black magnetite, the first fraction being less magnetic than the second fraction.

32. (Previously Presented) The process according to claim 31, wherein the step of magnetic separation is performed with a magnetic field in the range of 400 to 700 gauss.

33. (Previously Presented) The process according to claim 32, further comprising screening from the first fraction, particles having a grain size of 20 μm or more, to obtain a refined first fraction, leaching said refined first fraction with a solvent, to obtain a leached slurry; separating said leached slurry into a solid fraction containing ferrite pigments and a liquid fraction containing constituents of the first fraction soluble in said solvent; and drying said solid fraction to obtain dry pigments of ferrites.